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A NEW NEARCTIC *DIXA* (DIPTERA: DIXIDAE) FROM PENNSYLVANIA

T. Michael Peters

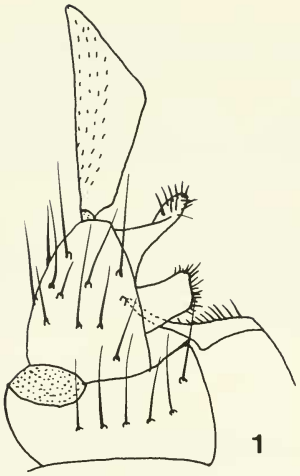
Professor and Curator, Department of Entomology, University of Massachusetts, Amherst, Massachusetts 01003.

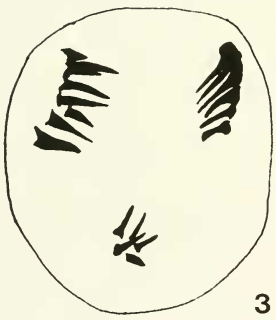
Abstract.—*Dixa* ***adleri,*** new species, from Pennsylvania is described with illustrations of the mature larva, male genitalia, and female bursa copulatrix. Adults are compared with other known Nearctic dixids. Larval habitats of dixid genera are compared.

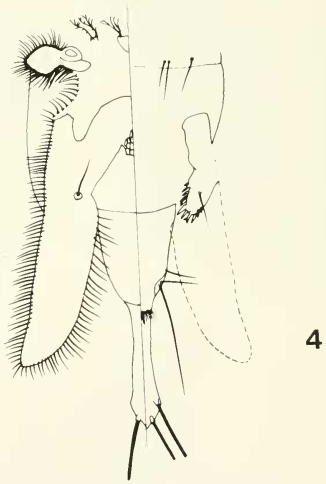
Larval Dixidae live in or just above the meniscus in a wide variety of freshwater habitats, from stagnant bogs to rushing brooks. The three Nearctic genera have been associated in the literature with distinct types of freshwater environments, differences that have been correlated with unique anatomical characteristics of each of the genera. However, comparison of environmental data available for a new species of *Dixa* found in eastern United States with those of my previous collections, revealed some anomalies. Following the description of the new species is a discussion of overlap in larval habitats of the two most widely distributed genera; *Dixa* Meigen and *Dixella* Dyar and Shannon.

Dixa adleri Peters, New Species
Figs. 1–4

Adult.—*Head*: Medium brown in specimens preserved in alcohol; without microtrichia; a line of 14 long setae along periphery of compound eye from dorsum of vertex to venter of eye; frontoclypeus with 2 or 3 setae near ventral edge; antennae concolorous with head, first flagellomere subcylindrical, width:length 1:10. *Thorax*: Medium brown in mature specimens, but with distinctly darker vittae on scutum, vittae indistinguishable in teneral individuals; anterior pronotum of male with 6–8 setae (9–11 in ♀) as long as width of sclerite; 1 seta near dorsal suture on posterior pronotum; scutellum of males with a transverse row of 11 setae, the central one with another posterior to it, scutellum of females with an anterior transverse row of 13 setae, followed by a transverse row of 3 setae and followed by a single mesal seta. *Wing:* Clear, without pigmented areas, length 3.25–3.69 mm (♂)(3.69–4.08 in ♀); in ♂ M3 + 4:M1 + 2 as 1:1.4–1.6, M3 + 4:Mst as 1:1.5–2.5; R2 + 3:R3 as 1:2.1–3.1; in ♀, vein ratios are within same range as those of ♂. Crossvein m-cu broken. *Halter:* Hyaline. *Legs:* Distal spiniform seta on 3rd tarsomere of foreleg (on tarsomeres 3–4 of 1 ♀), on 1–3 of midleg and on 1–4 of hindleg; basal recurved spiniform seta on tarsomere 5 of fore and midleg of ♂; claws simple in ♀, in ♂ hind claw simple, fore and midclaws with 5–6 ventral teeth (3–4 long, 1 short, 1 long); femur:tibia: tarsus length ratios of forelegs as 1:0.96–1.00:1.50–1.90 in ♂, in ♀ 1:0.96–1.00:1.40–1.48; midleg 1:0.92–1.05:1.13–1.74 in ♂, in ♀ 1:1.00–1.05:1.32–1.41; hindleg 1:1.00–1.05:1.54–1.74 in ♂, in ♀ 1:1.14–1.21:1.67–1.95. *Abdomen:* Mottled brown and grey, mixed lighter and darker areas; in ♂, 9th sternite widest laterally, wider than the more lightly sclerotized tergite 9; tergite 10 with non-segmented cerci (Fig. 1); gonocoxite and gonostylus as in Figs. 1 and 2; ejaculatory







Figs. 1–4. *Dixa adleri.* 1, Lateral view of male terminalia. 2, Dorsal view of same. 3, Bursa copulatrix. 4, Posterior abdominal structures of fourth instar larva; left half dorsal, right half ventral.

duct very short and very lightly sclerotized; claspette and penis valves not discernable in cleared glycerin mount, even under interference microscopy; ♀ with three tufts of setae in bursa copulatrix (Fig. 3).

Fourth instar larva.—Length 6.6–9.0 mm (n = 8); coloration of specimens available is bleached out, probably due to preservation techniques. Terminology follows Peters and Adamski (1982). *Head:* Seta 10 about ½

length of 9, length of 7 intermediate between them; head seta 1 long, wide; seta 2 slender but longer than 1, 3 very short and wide, widest at middle. Antenna: Tip with several sharp spines surrounding a larger, pear-shaped, thin-walled sensillum. *Thorax:* Anterior ventral setae of prothorax not extending beyond mouth brushes, arranged as 1-1-4-1-1-4-1-1, each group of 4 without common sclerotized base. *Abdomen:* Prolegs of segments 1 and 2 with uniordinal, biserial crochets of subequal length, anterior proleg preceded by row of spicules subequal in length to crochets, 25 crochets in first row, second row thickest, with 24 crochets; posterior proleg with 21 crochets per row, posterior row thickest, followed by an uneven line of thin spicules which are subequal in length to crochets; corona of branched spicules on dorsum of segments 2–7; ambulatory combs on venter of segments 5–7 each with 9–10 spines on either side of a medial subrectangular plate, spines in 2 distinct rows of alternating heavy and more slender spines, heavier ones projecting at less acute angle from surface of segment; segment 8 with only 6 slender setae on venter, shorter than length of segment; paraspiracular setae, postspiracular process, and metaspiracular plate as in Fig. 4; segment 9 with fringe of setae continuous from posterolateral process anterior to postspiracular process, median plate as in Fig. 4, pecten of anterolateral plate simple, as in Fig. 4; ventrolateral plate of segment 10 with a thick seta directed posteriorly, another arising near its base, is much more slender and directed laterally, anterior to the plate is another more dorsal hair; caudal hairs of postanal process over 2× length of process.

Specimens examined.—Holotype ♂, Slab Cabin Run, Pine Grove Mills, Centre Co., Pennsylvania, 18-IX-81, collected by Peter H. Adler with Malaise trap over stream; deposited in the Peters dixid collection, Department of Entomology, University of Massachusetts, Amherst, Massachusetts. Eighteen paratype 7 ♂ and 11 ♀, same data as holotype, with associated immature skins. Additional sites, all in Pennsylvania: 29 specimens from Scott Road (Slab Cabin Run), State College, and Briesly.

Discussion

If keyed using Peters and Cook (1966), mature *D. adleri* males come out as *Dixa fraterna* Garrett. They may be separated on the basis of the ejaculatory duct: it is large and heavily sclerotized in *D. fraterna,* but scarcely visible in *D. adleri.* Teneral males without distinctly darker scutal vittae key to *D. inextricata* but have more than 5 setae on the anterior pronotum. Females key to *D. fluvica* but may be separated by details of the bursa copulatrix. The three tufts of setae each possesses are subequal in length in *D. fluvica,* with the median group consisting of 3–4 setae. In *D. adleri* the median group is distinctly shorter than the other two and consists of 5–6 setae. All setae in the bursa copulatrix of *D. adleri* are very stout. They are slender in *D. fluvica.*

Collection sites for *Dixa adleri* are characterized in Adler et al. (1983) and Adler and Kim (1984). Adults were collected with a Malaise trap erected over the stream. Larvae were collected with drift nets. Several adults with associated larval and/or pupal skins were reared by Dr. Adler after whom the species is named.

In his lengthly discussion of larval habitat, Nowell (1952) observed that *Dixa* is a fast water form "always found out in the center of streams where the water is swiftest . . .," *Meringodixa* inhabits "quieter, smoother streams . . . congregating in quiet niches, or quiet pools . . ." while *Dixella* is "in two habitats [it] may be in swiftly running streams or in very still waters." He continued, "This is the only one of the groups which is represented in the quiet pools." These observations were based on California dixids and fit well the anatomical differences among larvae of each of the genera. *Dixa* has coronae of branched hydrofuge hairs on abdominal segments 2–7, while *Dixella* has no flotation structures other than those on the posterior that surround the spi-

racles in all known dixid larvae. *Meringodixa* has only the posterior flotation structure, but it has long lateral tufts of hairs on abdominal segments 2–6 that are reported to aid in flotation (Nowell, 1951).

While my own observations of *Dixa* and *Dixella* from other parts of the U.S. generally agree with Nowell's, the actual situation is more complex. Average current for my field collections is measured by timing a half-filled plastic vial over a measured distance. *Dixa* was collected from moving waters in 8 of 12 instances, with average current of 1.83 ft/s (range = 0.67–3.5 ft/s). *Dixella* was collected from predominantly still water—ponds, bogs, pools—in 14 of 23 instances, with average current in the other collections of 0.94 ft/s (range of 0.1–3.0 ft/s). An additional difference is that *Dixa* sometimes (4 of 12 instances) occurs where "emergent" vegetation is lacking, but *Dixella,* with one exception noted below, always (23 of 23 instances) is found where vegetation emerges from the water or vegetation on the bank (grasses, roots) hangs into the water. In six collections, where both *Dixa* and *Dixella* were present, four of six sites were still water, but current in the other two ranged from 1.0–2.6 ft/s. In one site, both genera were taken from rocky banks; all others had "emergent" vegetation.

Larval habitats of *Dixa* and *Dixella* apparently overlap to a great extent, with *Dixa* predominant in rapidly moving water and *Dixella* more common in still water. *Dixa* with its 6 coronae of branched, hydrofuge spicules should more effectively stay afloat in rapid water if caught in the current or undergoing a diel drift (Waters, 1962). Thus, *Dixa* has an anatomical advantage in rapidly moving water, but is not restricted to this environment. *Dixella* occurs in both moving and still water, but usually is found in areas with less rapid current than *Dixa.* They do occur together in both habitats, suggesting that larval habitat is controlled by two factors, maternal selection of oviposition site and sites available to the ovipositing female.

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